50X1-HUM

SHIP'S AIR-FOAM FIRE-FIGHTING EQUIPMENT ВПА

DESCRIPTION AND MAINTENANCE INSTRUCTIONS И 641-А76-204

50X1-HUM

SECRET

This book contains 18 pages and 5 insets (not secret).
The insets are placed between pages 16 and 17.

SECRET

50X1-HUM

1. DESCRIPTION

A. Purpose and Basic Specifications

The ship's fire-fighting equipment is designed for extinguishing burning liquids and solids (except for alcohols, ethers, powders), and also for extinguishing fires on the live (up to 380 V) electrical equipment.

Working pressure in system ..... 10 kgf/cm^2

Inner diameter of main line ..... 20 mm

Inner diameter of hoses ..... 12 mm

Length of hose on reel ..... 10 m

Capacity of each reservoir ..... 108 lit.

Number of stations ..... 2 pcs

Maximum time of system operation every other injection with the foamer amount contained in metering devices equal to 25.2 lit. (taking into account that metering devices are filled with the fourth foamer dose) ..... about 40 min.

Amount of foamer in metering devices ..... 25.2 lit.

Reservoir emptying time ..... 4 to 8 min.

Reservoir recharging time ..... about 3 min.

50X1-HUM

B. General Description and Description of Individual Units

(Appendix I)

Fire-fighting Equipment BTT and Principle of Its Operation

The pipeline of the fire-fighting system passes through all the compartments; reels with hoses, shut-off valves and three-way cocks are installed in each compartment.

The stations of fire-fighting equipment BTT are arranged in compartments I and VII.

The fire-fighting equipment includes:

- two reservoirs;
- two metering devices;
- 12 reels with rubber hoses and valve nozzles;
- air-foam pipeline with fittings and valves;
- air pipeline with fittings and valves;
- sweet water pipeline with fittings and valves;

Each station is designed for:

- storing the foamer (metering devices);
- storing the mixture of sweet water and foamer, for preparing the water-foam mixture and for delivering it into the main line (reservoirs).

Air-foam is pressure-fed along the pipeline by the station of compartment I. If this station fails, use the station of compartment VII. The metering devices are filled with foamer through the upper pipe union.

The air-foam pipeline is made up of red-copper pipes, 24x2, and union connections sealed by paronite gaskets. The pipeline is connected with the reservoirs and used for delivery of the air-foam mixture into the main line and from into the branches and reels. Three-way cocks 15 serve to cut off the branches and also a part of the air-foam pipeline when the latter is faulty. Valves 9 serve to cut off reels 16.

The air pipeline is made of red-copper pipes, 14x1.5, sealed by paronite gaskets.

50X1-HUM

50X1-HUM

Air is supplied at a pressure of 35 kgf/cm^2 from the medium-pressure main line to reducing valve 11 which reduces the pressure down to 10 kgf/cm^2.

The air is delivered at a pressure of 10 kgf/cm^2 to:

- metering device to force a foamer dose out of the metering chamber into the reservoir through valve 13;
- reservoir to force emulsion into the air-foam main line through valve 5;
- throttle plate to mix the emulsion with air and to form air-foam mixture.

The sweet water pipeline is made up of stainless-steel pipes, 32x2, and used to fill the reservoirs with sweet water, and also to feed the foamer dose from the metering chamber of the metering device into the reservoir.

The metering chamber of the metering device is filled through valve 2. Sweet water is supplied into the reservoir and mixed up with foamer to form emulsion. As the emulsion is forced out of the reservoir it is saturated with air bubbles (the air is supplied through the throttle place), forming an air-foam mixture.

The foam-to-emulsion volume ratio must be within 8 to 12, i.e. 800 to 1200 lit. of foam must be obtained from 108 lit. of emulsion.

As the foam covers the burning surfaces, it admits no air to the source of fire, and the fire ceases.

Reservoir (Appendix 2)

The steel cylindrical reservoir is designed to store emulsion. The reservoir consists of steel body 41, welded spherical cover 46 and bottom 44.

Welded onto cover 46 are:

(a) boss to receive safety valve 40;

(b) pipe union 47 to connect the sweet water pipeline;

(c) pipe union 49 with a syphon pipe 42 to connect the air-foam pipeline;

(d) pipe union 48 to connect the air pipeline.

50X1-HUM

Drain plug 43 provided in the bottom serves to drain emulsion from the reservoir.

The reservoir rests upon the foundation with its lugs 45.

Metering Device
(Appendix 3)

The steel cylindrical metering device serves to store 12.6 lit. (three 4.2 lit. doses) of foamer. The metering device consists of two chambers: upper main chamber and lower metering chamber partitioned by diaphragm 63. The upper chamber contains 8.4 lit. of foamer, and the lower chamber, 4.2 lit.

The diaphragm is fitted with vent pipe 65 through which the metering chamber is ventilated, and compressed air is supplied to force out the foamer dose into the reservoir.

Screwed into bottom 72 is four-way piece 58 with shut-off valves 56 and 59. Shut-off valve 56 separates the upper and lower chambers of the metering device, communicating through pipe 70; the latter serves to pass the foamer dose from the upper chamber into the lower one. Cap nut 57 serves to drain the foamer.

Welded to cover 66 are:

(a) pipe union 67 to connect the air pipeline;

(b) pipe union 68 (with stopper 69) to fill in foamer.

Reel with Hose
(Appendix 4)

The reel is designed for accommodating the rubberized hoses with valve-nozzles. The reel consists of body 80 and supports 82 through which the reel is secured to the foundation. Wound around the reel body is rubberized hose 81 whose end is fitted with valve-nozzle 93.

Hose length -10 m., inner diameter - 12 mm. The reel is connected with the main line through a pipe union which is joined with spindle 8[illegible]

through a gland provided with bushing 86. The gland makes it possible to turn the reel when winding and unwinding the hose.

Reducing Valve

(Appendix 5)

The reducing valve is designed for reducing the air pressure from 35 kgf/cm^2 to 10 kgf/cm^2.

Air is supplied at a pressure of 35 kgf/cm^2 to pipe union 116; it passes through filter 129 into chamber "A" and to under the disc of valve 101 where it is reduced down to 10 kgf/cm^2) and then into outlet pipe union 121.

The valve is opened by the effort of spring 104 transmitted to the plate of diaphragm 110 on whose other side a low-pressure air (10 kgf/cm^2) is exerted from chamber Б.

The clearance between the disc of valve 101 and the seat automatically varies with the air flow rate so that the pressure in chamber Б is equal to 10 kgf/cm^2. If the flow rate increases, the air pressure in chamber Б decreases, and the spring lifts the valve disc; the flow rate rises, and the pressure in chamber Б becomes normal. If the rate of air flow through the valve decreases, the pressure in chamber Б rises, the pressure exerted upon the diaphragm increases, and the valve is closed. The rate of air flow through the valve decreases, and the pressure in chamber Б becomes normal again. The valve is adjusted by the use of screw 107.

A safety valve adjusted for 13 kgf/cm^2 serves to prevent rise of air pressure in the system when the reducing valve is unserviceable. The safety valve consists of rod 126 and spring 123. The valve is adjusted by the use of bushing 125 and is determined by the height of lock 124.

C. Measuring Instruments

The pressure in the system is checked by pressure gauges 3 located in compartments I and VII; the scale range is from 0 to 25 kgf/cm^2; plotted opposite 10 kgf/cm^2 is a red notch.

II. MAINTENANCE IN SERVICE

A. Attendance

When in service:

- see that the system is always serviceable and ready for use;
- see that the pipeline connections, fittings, and valves are tight;
- see that easy access to all the valves is provided;
- with pressure inside the pipeline, open the valves smoothly;
- regularly lubricate the rubbing parts of the fittings and valves;
- keep the identification strips in good condition;
- when necessary, restore the paint and markings indicating the direction of valve rotation;
- see that the pressure gauges and the safety valves are in good condition and sealed. If pressure gauge indications are not correct, or the seals are torn off, or the term of the scheduled check has expired, have the gauges checked or replaced.

B. Preparation for Use

Initial position

In the initial position both reservoirs are charged, the metering devices are charged to capacity, and the system is ready for action depending on the reservoir of compartment 1. In this case:

- valves 5,12 in compartments I and VII and valve 10 in compartment I are open;
- the other valves are closed;
- pressure gauge 3 in compartments I and VII read the pressure of 10 kgf/cm^2;
- three-way cocks 15 are set to ensure passage along the main line and to the reels, and sealed;
- hoses 7 are disconnected from valves 6.

C. Putting the System In and Out of Action

In case of fire in any of the compartments, proceed as follows:

1. Open valve 9.

2. Unwind the hose from reel to the necessary length.

3. Open valve-nozzle 93 and direct the foam spray towards the source of fire.

When the fire-fighting system is put into operation, the watchmen must stand beside the reservoirs to quickly recharge the stations. As soon as the entire amount of mixture in the reservoir of compartment I is consumed, start the station of compartment VII and disconnect the station of compartment I, for which purpose do the following:

(a) open valve 10 in compartment VII;

(b) close valves 5,10 in compartment I;

(c) charge the used reservoir according to Items 9,17 to 25.

4. To put the system out of action:

- close the valve-nozzle of the used reel.

On the reservoir which has been the last to be used:

- close valve 10;

- close valve 5;

- open valve 4 and drain plug 43 of the reservoir;

- drain the remaining mixture into the bilge, and then close valve 4 and drain plug 43.

5. Blow the main line with air through the most distant reel and through the reel used to extinguish fire, for which purpose:

(a) open the valve-nozzles and valves 9 of the reel used to extinguish the fire and of the most distant reel;

(b) open valves 5 and 10 of the reservoir which has been the last to be used, and force the remaining mixture into the bilge by compressed air until pure air starts coming out of both reels;

(c) close valves 5,9 and 10 and the valve-nozzles;

(d) charge the reservoir.

50X1-HUM

Note. If the foam supply must be stopped for a short period of time, close the valve-nozzle; if the supply must be cut off for a long period of time, close valve 9 and discharge the remaining foam from the hose through the valve-nozzle.

Charging the Reservoirs and Connecting Them to Main Line

6. To charge the reservoirs, perform the following operations which are similar for both stations:

- preparation for charging;
- filling the metering devices with foamer (at the base);
- delivery of foamer dose into the reservoir;
- filling the reservoir with sweet water and preparing the metering device.

CAUTION: While recharging the reservoir, provide for system operation from the other station.

Preparation for charging:

7. Close valve 10.

8. Close valve 5.

9. Open valve 4.

10. Open drain plug 43 of the reservoir, drain the remaining mixture into the bilge, and then close drain plug 43.

Note. While recharging the station in the process of fire extinguishing, do not perform Operation 10.

Filling the metering device:

Fill the metering device at the base after the entire amount of foamer has been consumed. For this purpose, do the following:

11. Open valve 14.

12. Open cap nut 69.

13. Open valve 2 and fill the metering device with foamer until the upper pipe union is reached.

14. Screw on cap nut 69 and close valves 2 and 14.

15. Supply the foamer dose into the reservoir according to Items 17 to 19.

50X1-HUM

16. Replenish the metering device with the fourth dose of foamer according to Items 11 to 14.

Delivery of foamer dose into reservoir

Perform operations indicated in Items 7 to 10 and then proceed as follows:

17. Open valves 1 and 13 and feed a foamer dose into the reservoir.

18. As soon as a strong air spray starts coming out of valve 4, close valves 13 and 1.

19. Force the next foamer dose into the metering chamber of the metering device, for which purpose open valve 2; after that, close valve 2.

Filling the reservoir with sweet water and preparing the metering device

Perform operations indicated in Items 7 to 10 and 11 to 14 and then proceed as follows:

20. Connect hose 7 to valve 6.

21. Open valves 6 and 8.

22. As soon as emulsion starts coming out of valve 4, close valves 6 and 8.

23. Close valve 4.

24. Disconnect hose 7 from valve 6.

25. Put the system into the initial position.

CAUTION: Never fill the reservoir with sea water since foam in this case becomes conductive. While recharging the station in the process of fire extinguishing, do not perform Operation indicated in Item 24.

Measures to Be Taken to Ensure Damage Resistance

26. If the main line is faulty, cut off the damaged section by the use of three-way cocks 15 located at both sides of the section (from both bow and stern sides). (See Fig.1).

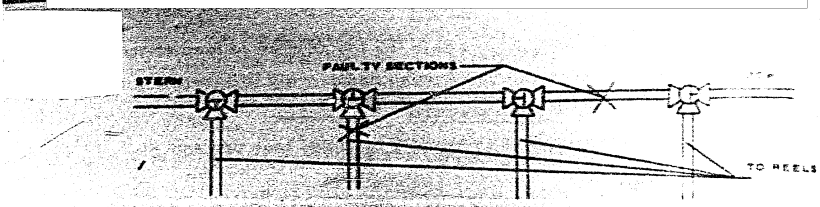


FIG. 1

D. Troubles and Remedies

Nos	Trouble	Cause	Remedy
1	With valve-nozzle opened, foam does not come out in continuous spray (during test)	Foam locks in main line	Blow main line through reservoir of compartment I or VII, upon draining the emulsion from it
2	With valve-nozzle opened, thin or thick foam comes out (during test)	Foam-to-emulsion ratio does not meet the requirement (n=8 to 12)	Adjust air suction through throttle plate by decreasing or increasing its inner diameter

E. Preventive Maintenance

27. Preventive maintenance is compulsory; its purpose is:

(a) to prevent premature wear of the system units;

(b) to detect troubles and faults and eliminate them in due time.

28. Troubles detected in the process of system operation must be eliminated immediately without waiting for the next scheduled maintenance.

29. To operate the system, with the troubles not eliminated, is forbidden.

30. Depending upon the character and scope of maintenance operations the scheduled inspections are divided into daily, weekly, monthly, and other inspections and repairs.

31. With the submarine undergoing medium or running repair, the fire-fighting system should be inspected at the same intervals as in service.

Daily Inspection

32. Check the pressure in the reservoir. It must be not less than 10 kgf/cm^2.

33. Inspect and clean the pipelines, fittings, measuring instruments and safety valves.

Note. Be sure to check non-return valves 12 for proper operation of the medium-pressure air system, since if the valves are faulty, foam may penetrate into the electrolyte mechanical mixing system.

Weekly Inspection

Perform all the operations to be done during daily inspection, and additionally do the following:

34. Check, clean and run in all the valves and cocks.

35. Check the safety valves for popping.

Quarterly Inspection

Perform all the operations to be done during daily inspection, additionally do the following:

36. Check the system for reliable operation by supplying the foam through one of the hoses.

Note. During each subsequent check, supply the foam through other hoses.

Yearly Inspection

37. Check the foam quality, for which purpose fill a measuring glass (capacity not more than 1 lit. and diameter not more than 60 mm). Foam persistence is considered sufficient, if the amount of foam decomposed for 30 min. does not exceed 20 volume per cent.

38. Drain the water-foamer mixture and blow the system with air; charge the system again and prepare it for use. If the foam persistence is not sufficient, charge the system with fresh foamer.

39. Check the pressure gauges.

Inspection during Running Repair of Ship

40. Overhaul the valves and fittings, the air reducing valves and replace worn-out parts. Test the system for tightness.

41. After repair involving the overhaul of the valves, fittings and pipelines, be sure to check the system together with the reservoirs and metering devices for tightness by an air pressure of 10 kgf/cm^2.

To test the system for tightness, proceed as follows:

42. Open valves 12,5,10 and 13 in compartment I, and see that valve 10 in compartment VII is closed.

Pressure gauges 3 in compartments I and VII should read 10 kgf/cm^2.

All the other valves must be closed.

43. Close valves 12 in compartments I and VII and check the entire pipeline for tightness by soap emulsion.

F. Reference Data

The system employs foamer PO-1 which is dark-brown liquid containing sodium salt (surface-active agent), bone glue (stabilizing agent), and ethyl alcohol.

The surface-active agent decreases the surface tension of water thus increasing its ability of foaming; the stabilizing agent increases the persistence of the foam; the crude ethyl alcohol decreases the freezing point of foamer down to -8°C.

The foamer reaction is neutral or weak-alkaline.

The principle of system operation is based on internal foam production.

The foam includes 90 vol.-% of air, 9.6 vol.-% of sweet water and 0.4 vol.-% foamer. The specific weight of the foam is equal to 0.1 gr/cm^3.

The amount of foam produced by the reservoir must be within 800 to 00 litres which corresponds to the foam-to-emulsion ratio within 8 12. The rated ratio is n=10.

$$n = \frac{V_{foam}}{V_{liquid}}$$

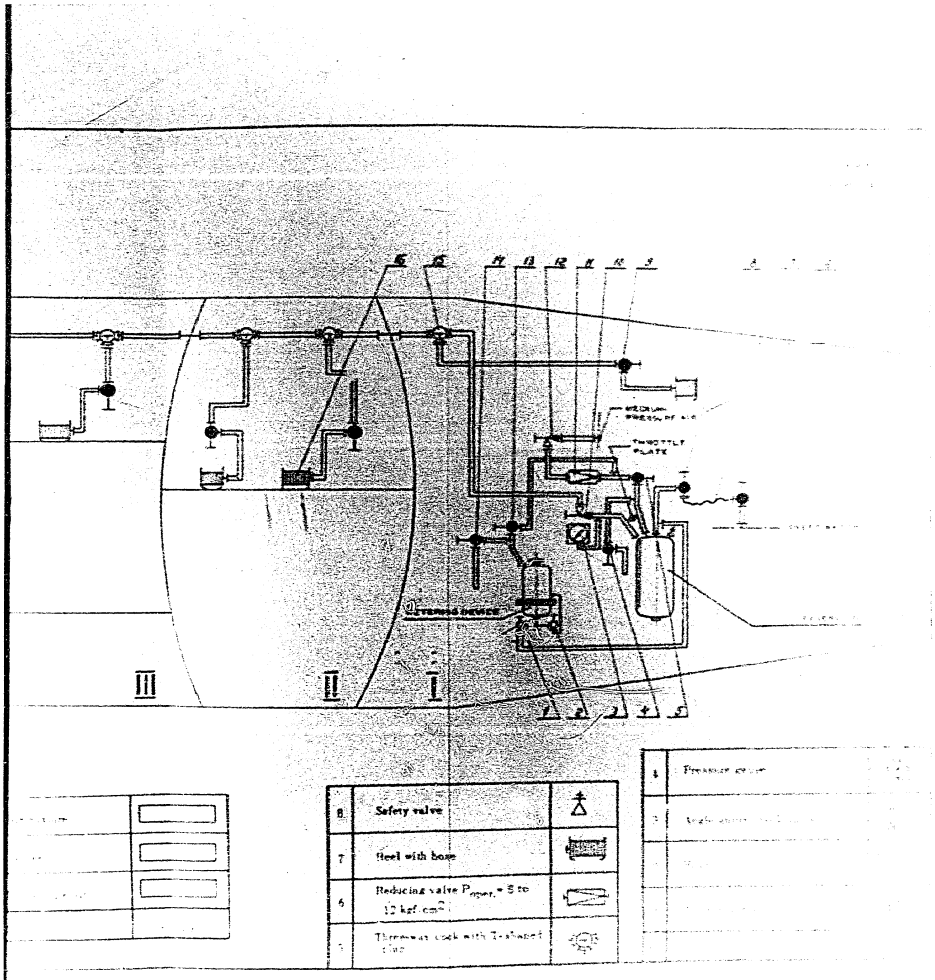
where:

n - foam-to-emulsion ratio;

V_{foam} - foam volume in m^3;

V_{liquid} - liquid volume in m^3.

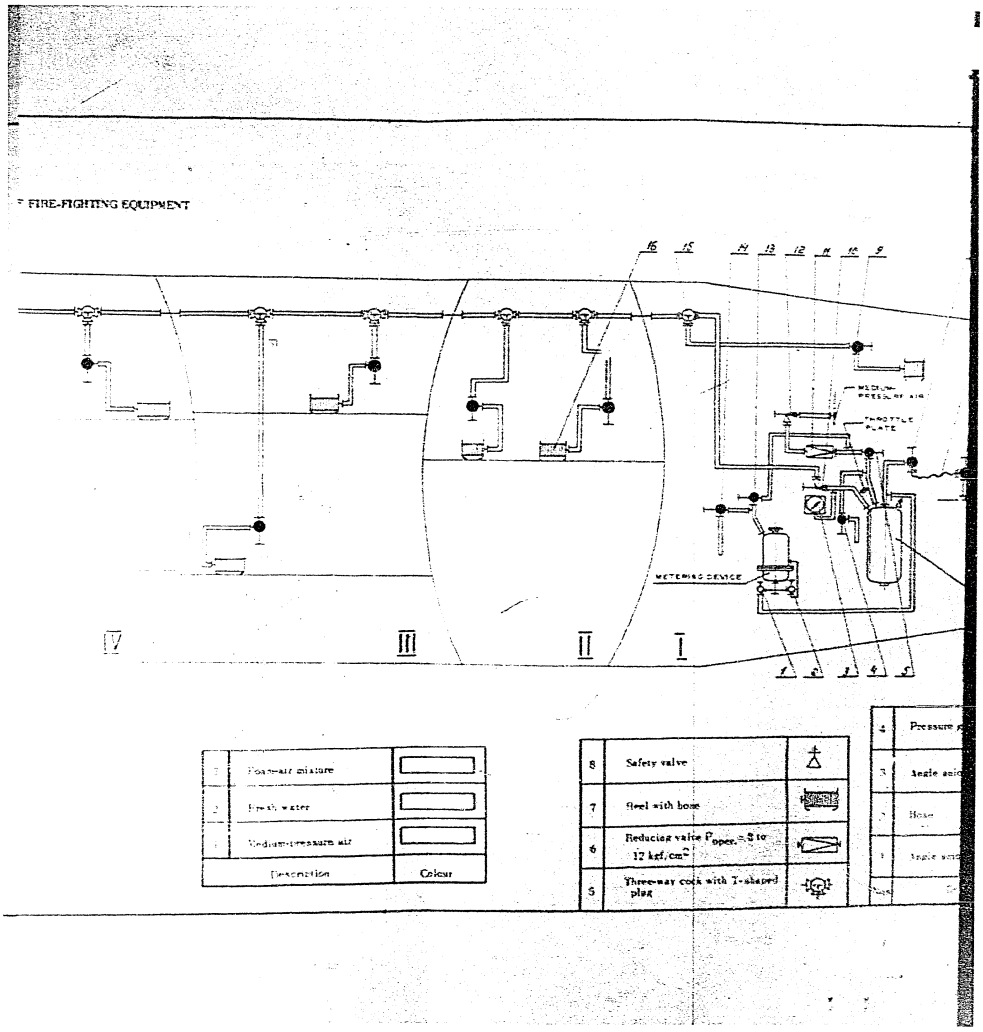
50X1-HUM



50X1-HUM

SECRET

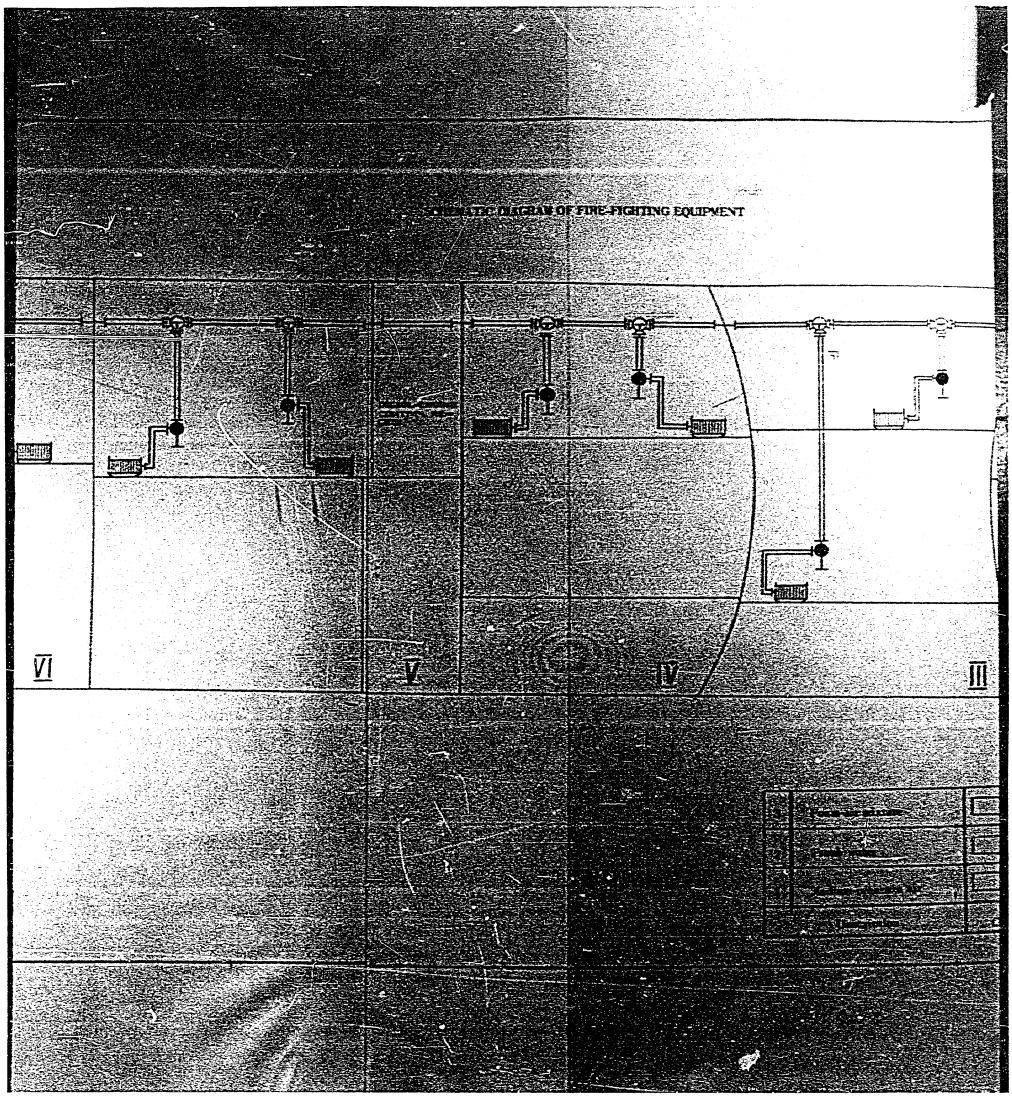
50X1-HUM



SECRET

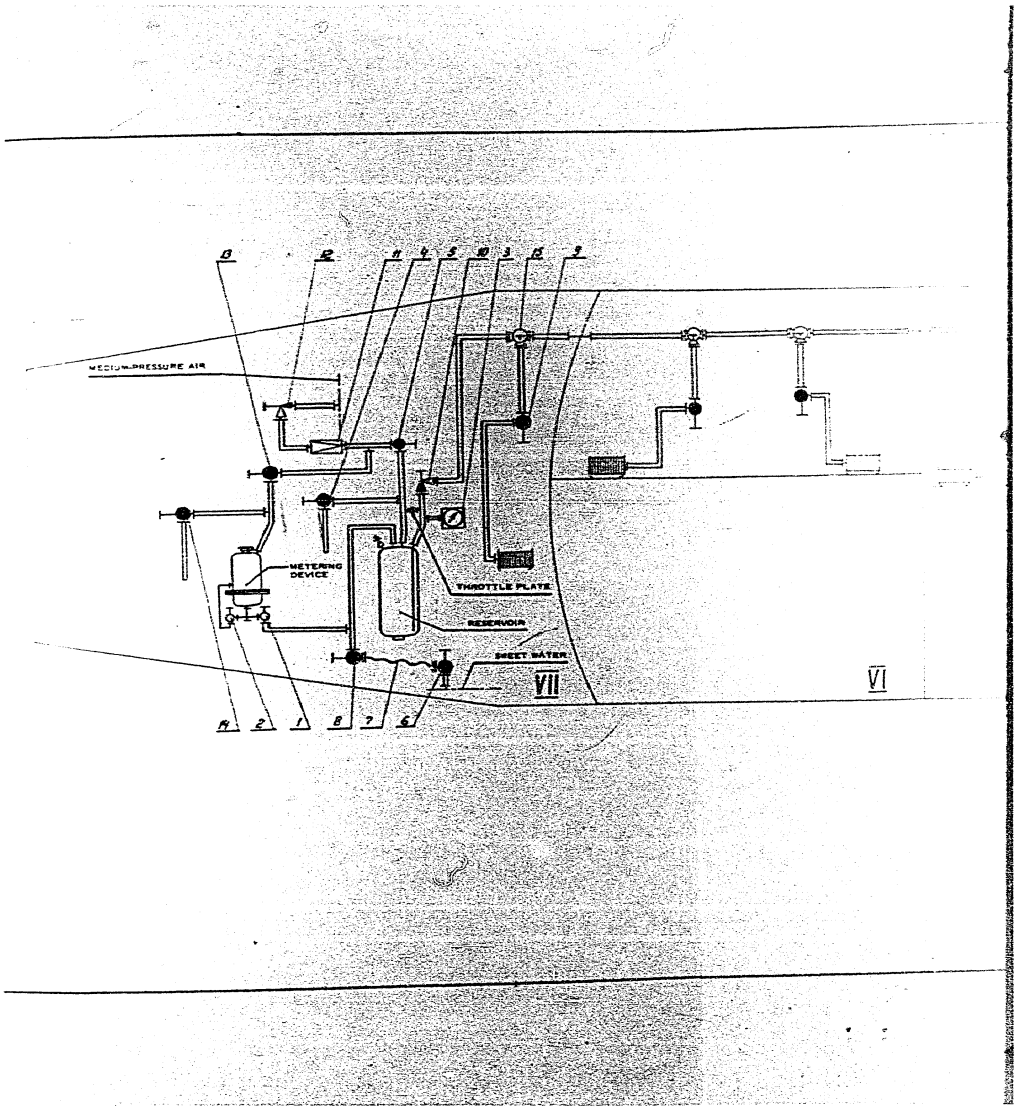
50X1-HUM

50X1-HUM



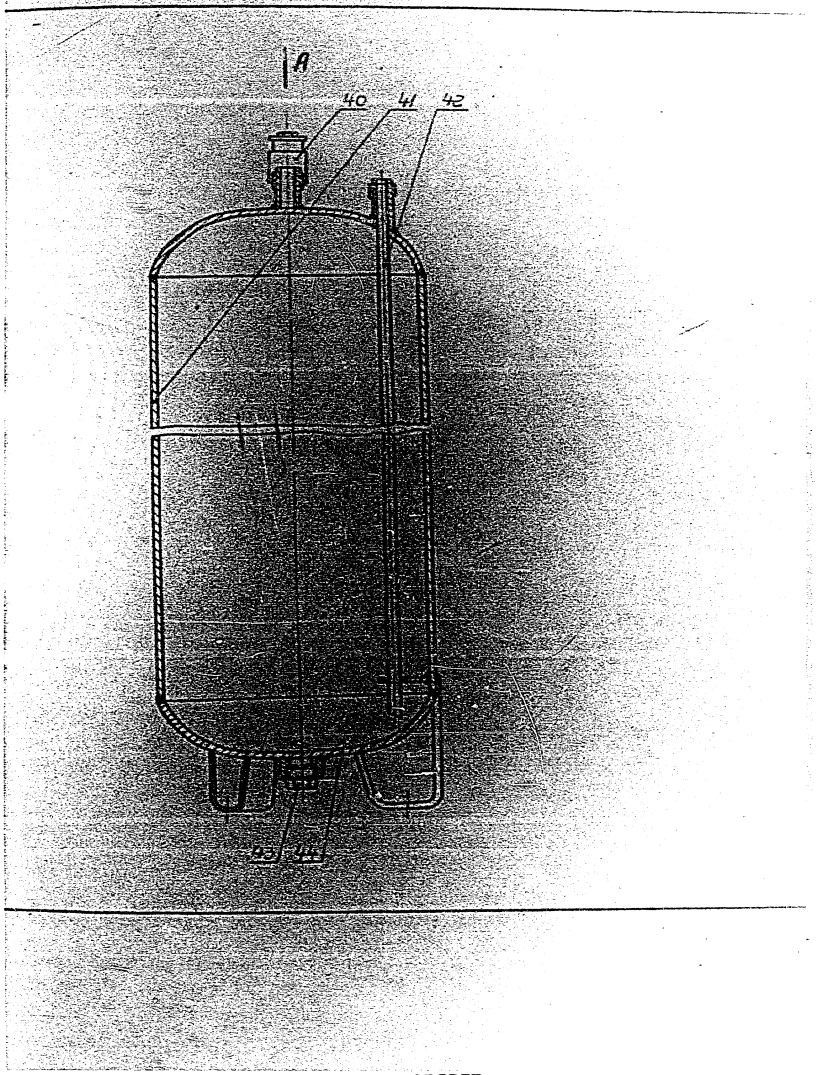
50X1-HUM

50X1-HUM



50X1-HUM

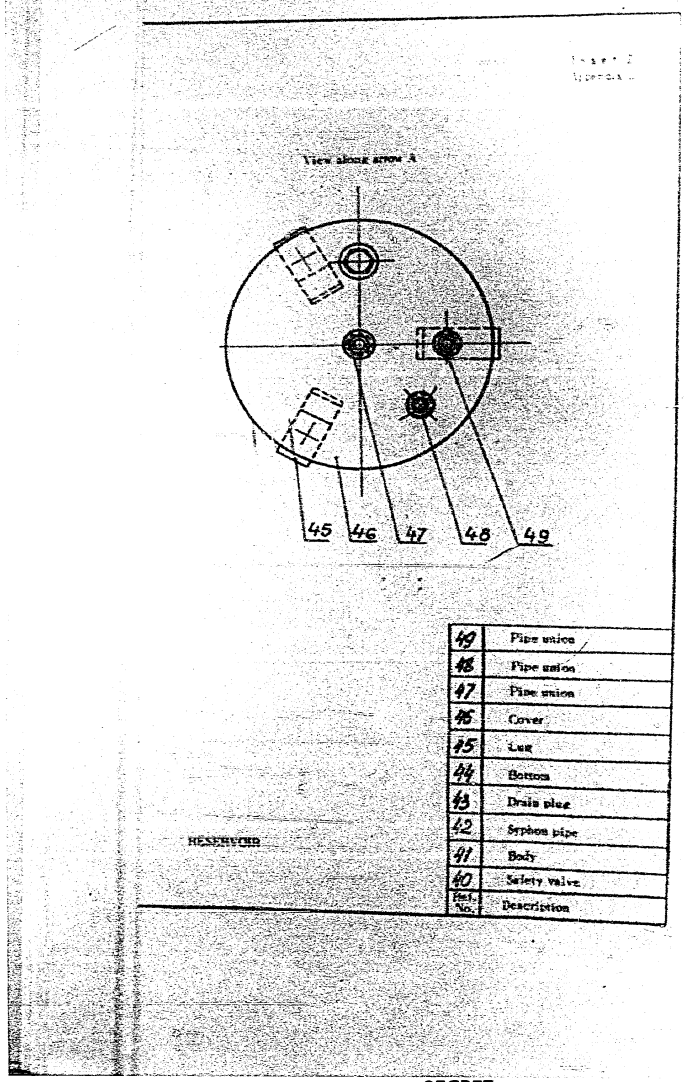
50X1-HUM



50X1-HUM

SECRET

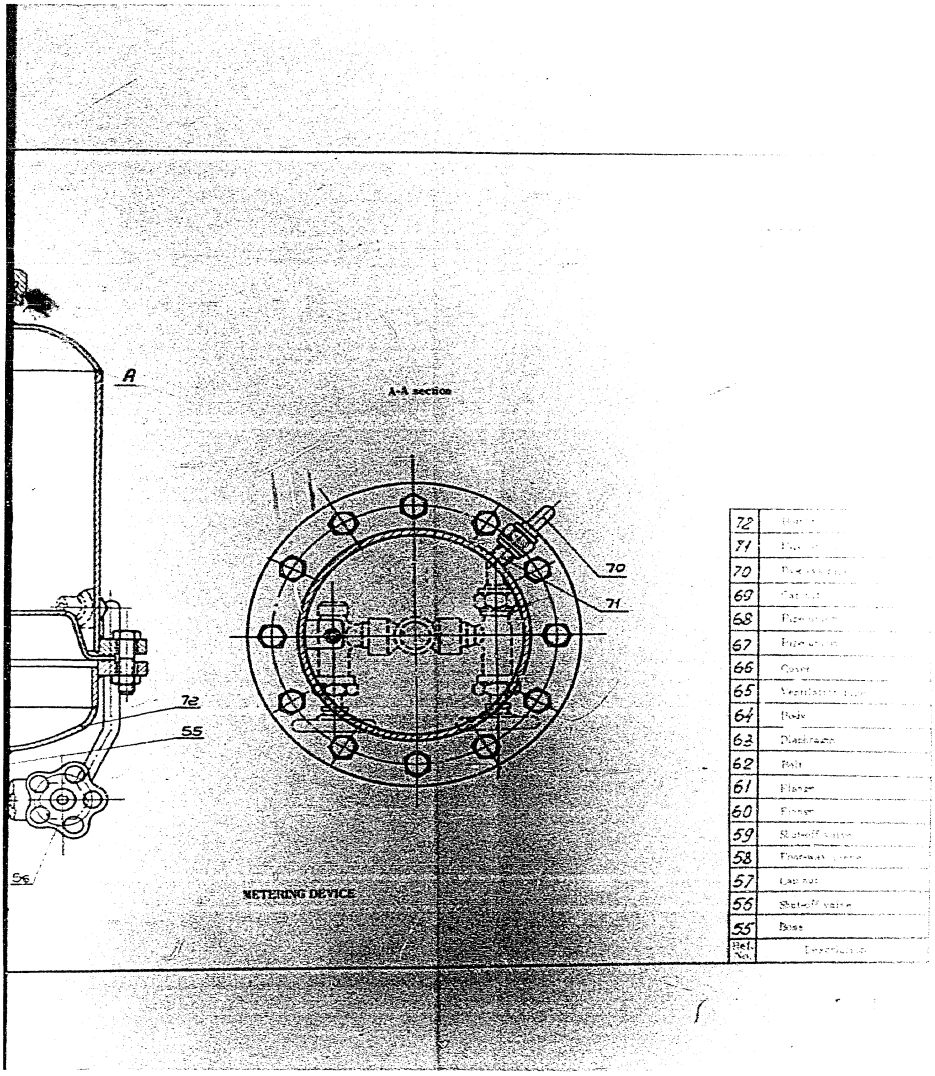
50X1-HUM



Part No.	Description
49	Pipe union
48	Pipe union
47	Pipe union
46	Cover
45	Leg
44	Bottom
43	Drain plug
42	Syphon pipe
41	Body
40	Safety valve

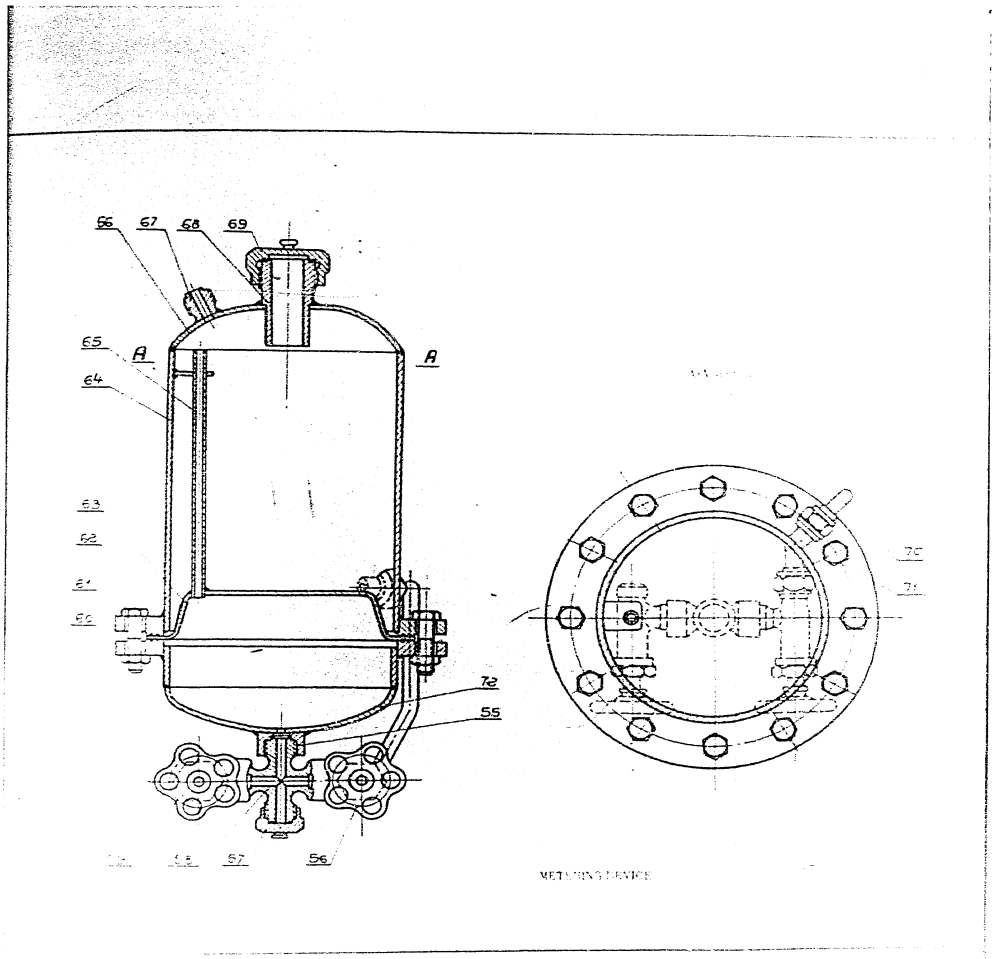
SECRET

50X1-HUM



SECRET

50X1-HUM

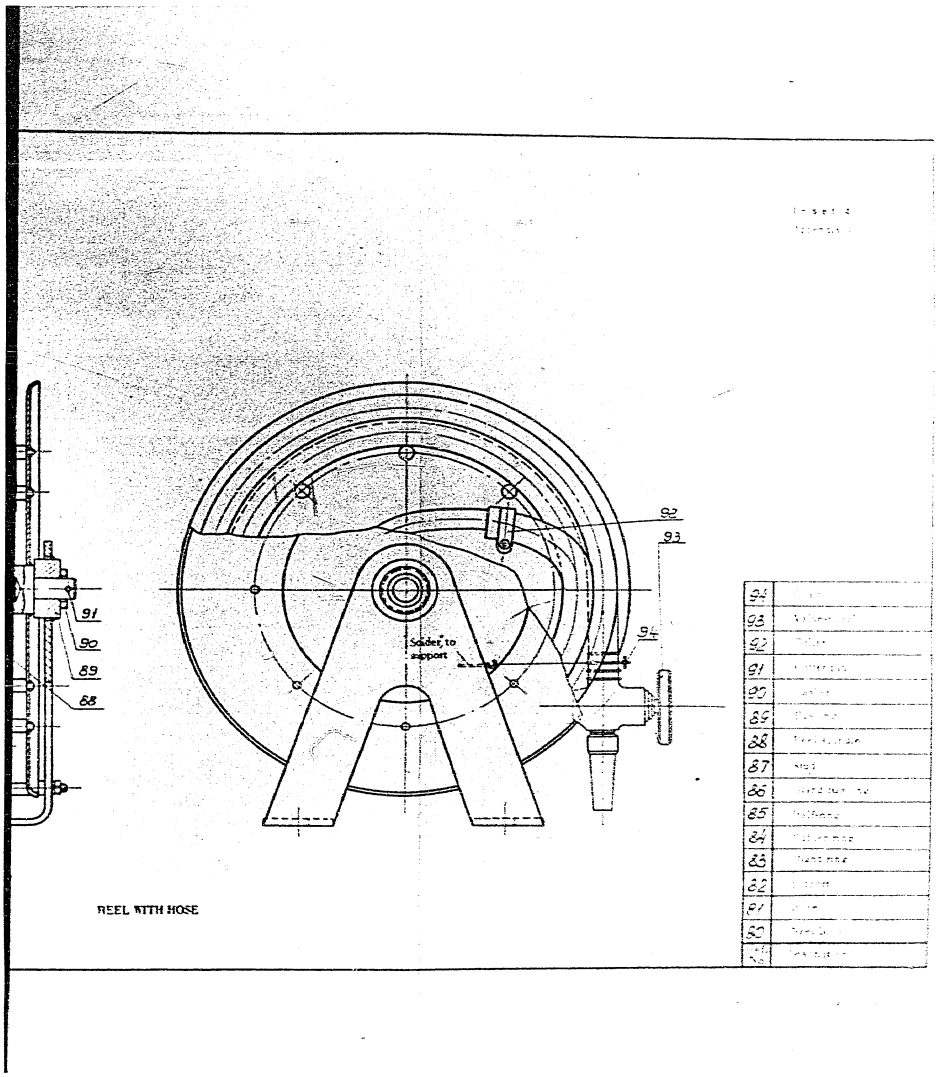


SECRET

50X1-HUM

SECRET

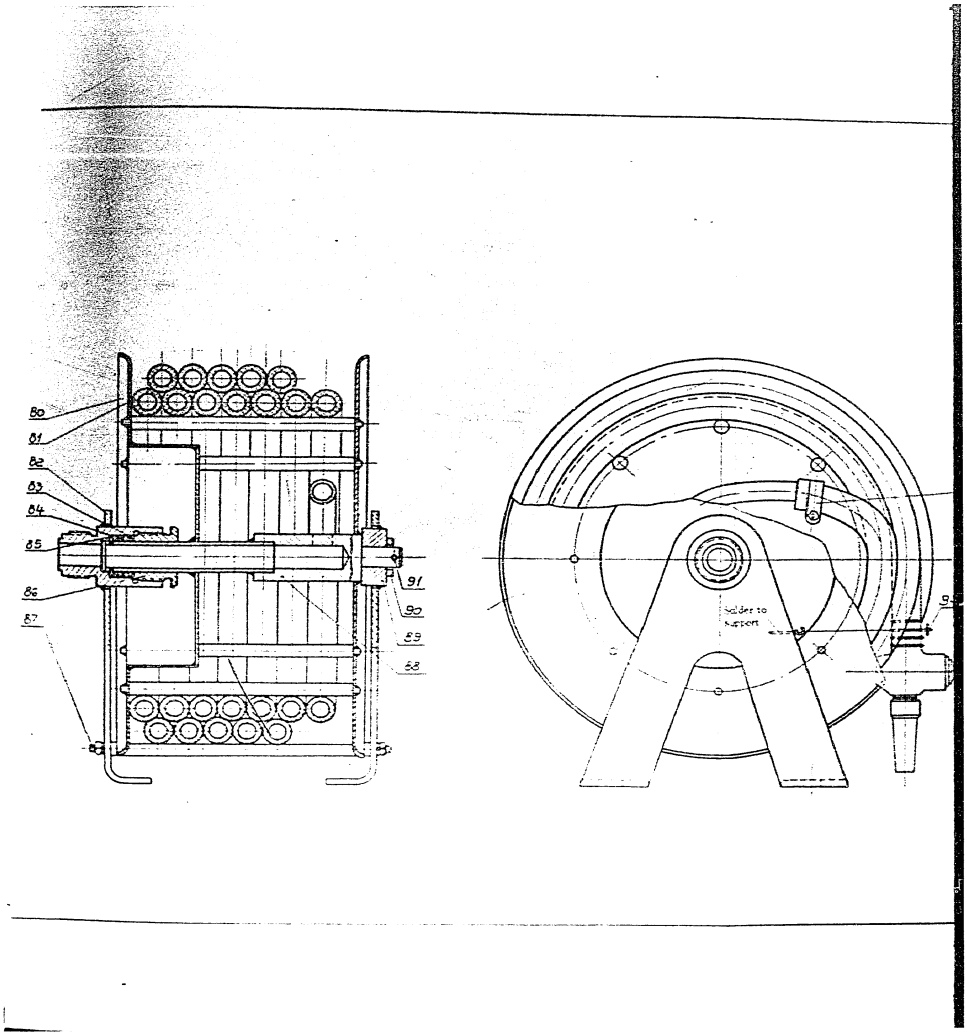
50X1-HUM



SECRET

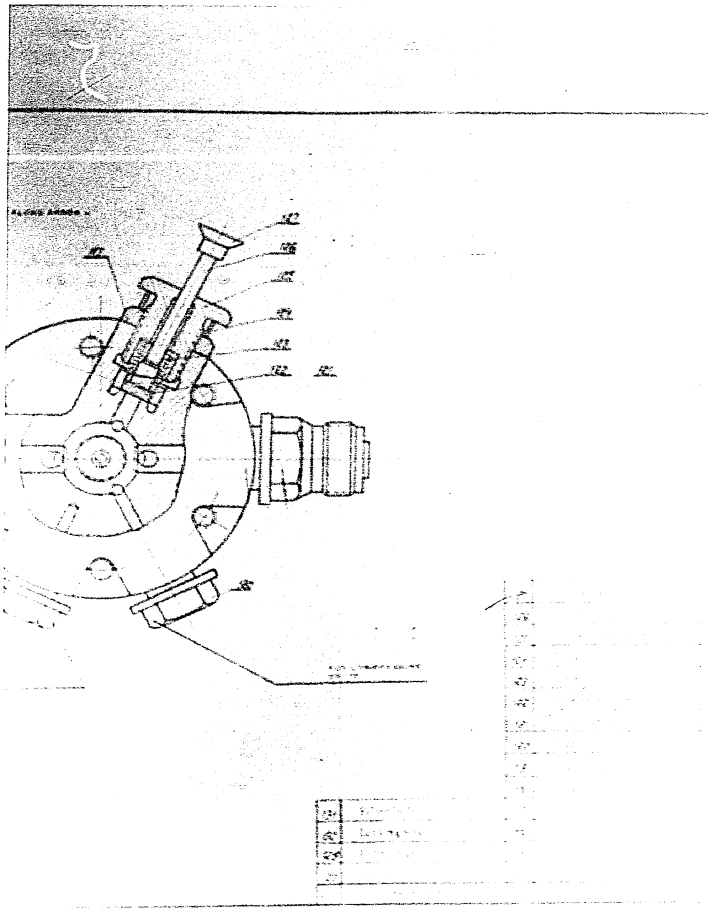
50X1-HUM

50X1-HUM



50X1-HUM

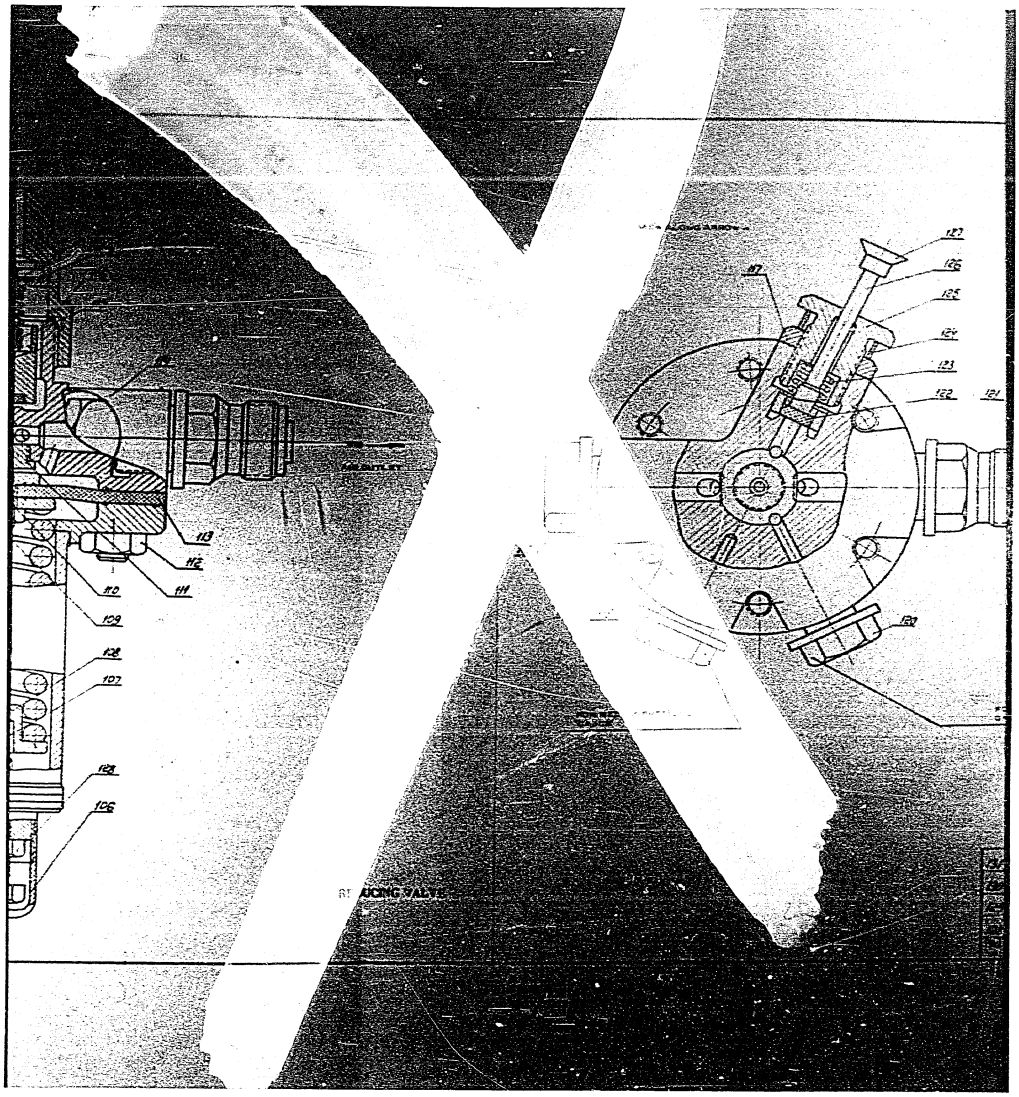
50X1-HUM



50X1-HUM

SECRET

50X1-HUM

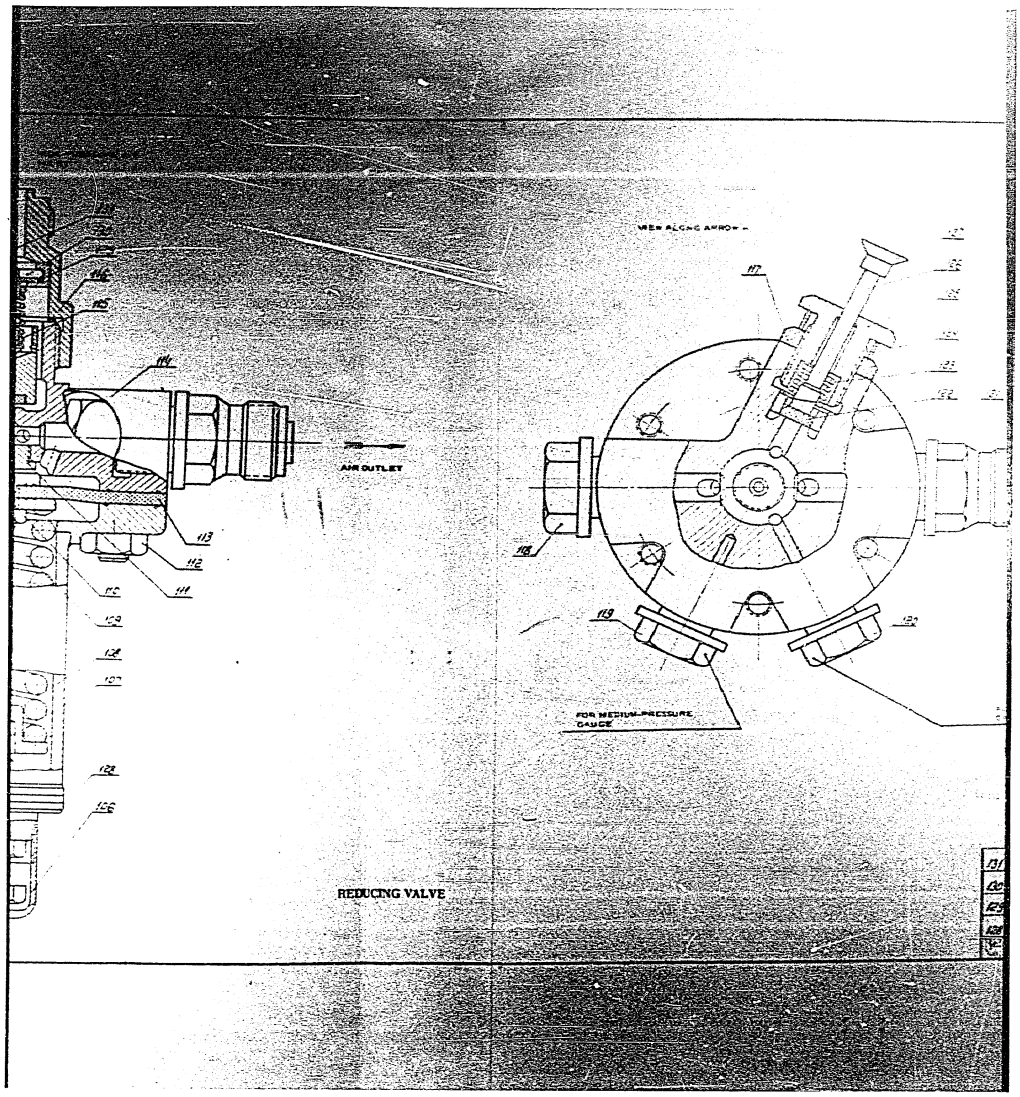


SECRET

50X1-HUM

SECRET

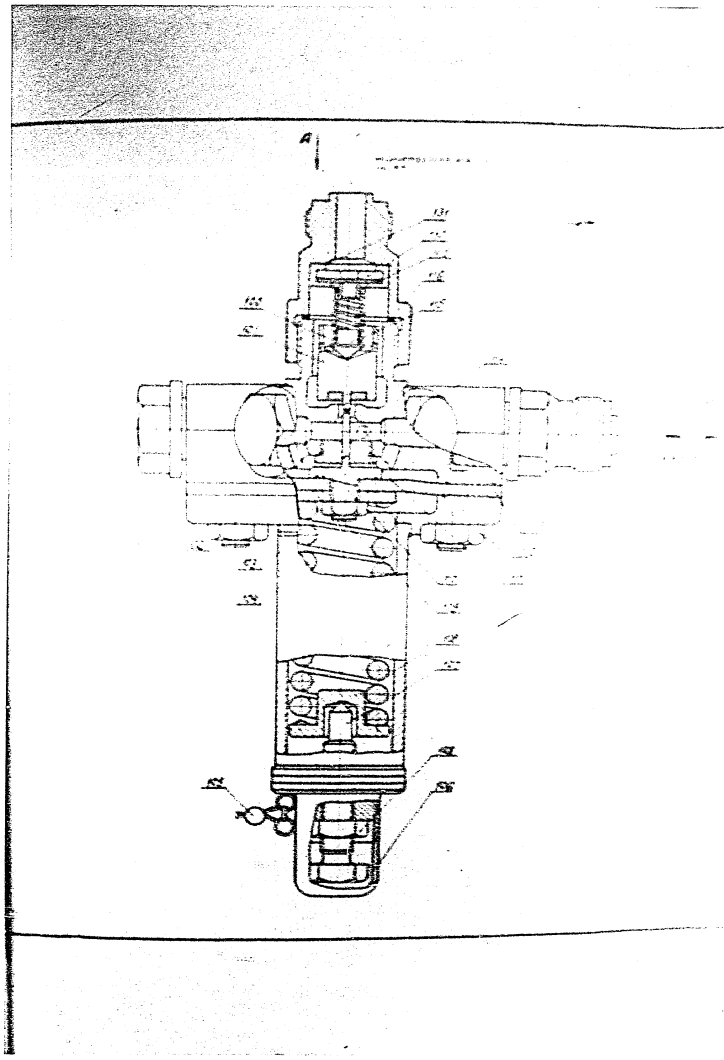
50X1-HUM



SECRET

50X1-HUM

50X1-HUM



50X1-HUM

CONTENTS